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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/639,625	08/15/2000	Steven Towle	42390P7195	1669

7590

05/02/2003

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EXAMINER

OWENS, DOUGLAS W

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/639,625

Applicant(s)

TOWLE ET AL.

Examiner

Douglas W Owens

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17, 21 and 23-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 21 and 23-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 10, 2003 has been entered.

Claim Objections

2. Claim 13 is objected to because of the following informalities: the word "fluorinated" should be inserted between "the" and "material". Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 – 17, 21 and 23 – 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. 6,284,657 to Chooi et al.

Regarding claims 1, 2, 10, 21, 29, 30 and 31, Chooi et al. teaches a method of forming a dielectric, (Figs. 15 – 20) comprising:

forming a planar fluorine containing insulating film, selected from the group consisting of a-C:F, parylene-F (AF4) or SiOF (FSG) (Col. 9, lines 39 – 44) (14);

depositing a hardmask layer (16) on the top surface of the fluorine containing film;

forming via openings (22, 24) in the fluorinated material, wherein the via openings define sidewalls; and

exposing the fluorine containing film, and the sidewalls thereof to a reducing plasma, wherein the plasma is formed in a chamber remote from the chamber containing the substrate (Col. 9, lines 48 – 52). Chooi et al. does not explicitly state that the plasma is formed in a chamber separate from the substrate, Chooi et al. describes a method of generated a plasma that is used to generate remote plasma. Additionally, Chooi et al. teaches against exposing the fluorine containing dielectric material to temperatures above 300° C, which would have been required if the plasma were generated in the same chamber containing the substrate.

Chooi et al. does not teach forming the dielectric on a substrate. It would have been obvious to one of ordinary skill to form the device on a substrate, such as silicon, since it is a commonly used and well-known starting material for micro-electronic devices.

Chooi et al. does not teach placing the substrate in a reaction chamber. It would have been obvious to one of ordinary skill in the art to place the substrate in a reaction chamber, since it is desirable to place the substrate in a controlled environment before exposing it to chemical reactants.

Regarding claim 3, Chooi et al. teaches a method, wherein the fluorine containing film has exposed sidewalls.

Regarding claim 4, Chooi et al. teaches a method, wherein the fluorine containing film has a covered top surface.

Regarding claim 5, Chooi et al. teaches a method, wherein the plasma is formed from a hydrogen bearing precursor gas (Col. 9, lines 45 – 48). Chooi et al. does not teach a carrier gas. It would have been obvious to one of ordinary skill in the art to use a carrier gas since the carrier gas is needed to transport the plasma.

Regarding claim 6, Chooi et al. teaches a method, wherein the hydrogen bearing precursor comprises NH_3 gas.

Regarding claim 7, Chooi et al. does not teach a method, wherein the carrier gas comprises a gas selected from the group consisting of N_2 , Ar and He. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use N_2 , Ar or He, since they are known gasses that are well suited for the intended use.

Regarding claims 8, 9, 11, 13 and 24, Chooi et al. teaches a method, wherein the fluorine containing film comprises a material selected from the group consisting of a-C:F, parylene-F (AF4) or SiOF (FSG) (Col. 9, lines 39 – 44).

Regarding claims 12, 23 and 32, Chooi et al. teaches a method, further comprising depositing a conductive material (Col. 10, lines 22 – 25) in the via openings.

Regarding claims 14 and 25, Chooi et al. teaches a method, further comprising depositing a hardmask layer (16, 20) over the parylene-AF4 prior to forming the via openings.

Regarding claims 15, 26 and 33, Chooi et al. teaches a method, wherein the depositing the hardmask comprises forming a layer of silicon nitride (Col. 9, lines 62 – 64) over the fluorinated material.

Regarding claims 16, 27 and 34, Chooi et al. teaches a method, wherein the plasma is formed in a reaction chamber from ammonia at a pressure between 1 mTorr and 50 mTorr and an RF power of between 100 W and 2000 W, which includes the range of 100 W to 500 W (Col. 9, lines 48 – 52). Chooi et al. does not teach an argon carrier gas. It would have been obvious to one of ordinary skill in the art to use a carrier gas, since the carrier gas is needed to transport the plasma. It would have been further obvious to select argon, since it is a known material that is well suited for the intended use.

Regarding claims 17, 28 and 35, Chooi et al. does not teach a method, wherein the plasma is passed into the reaction chamber at a flow rate in the range of 10 sccm to 3 liters/minute. The flow rate of delivering the plasma is a known variable that is subject to optimization. It would have been obvious to one of ordinary skill in the art to find the optimal flow rate through routine experimentation. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Response to Arguments

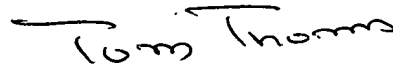
5. Applicant's arguments with respect to claims 1 –17, 21 and 23 – 35 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

DWO
April 29, 2003